

## **MINUTES**

### **CALIFORNIA TRAFFIC CONTROL DEVICES COMMITTEE MEETING OF January 30, 1997**

The first meeting of the CTCDC in 1997 was held in the Council Chambers of the Palm Desert Civic Center in the City of Palm Desert, on January 30, 1997.

Chairman Wayne Tanda opened the meeting at 9:07 a.m. with the introduction of members and guests. The Chairman thanked Mr. Dick Folkers and the City of Palm Desert for their gracious hospitality on behalf of the Committee.

The following members, alternates, and guests were in attendance:

| <b>ATTENDEES</b>             | <b>ORGANIZATION</b>   | <b>TELEPHONE</b> |
|------------------------------|---|------------------|
| Members (Voting)             |   |                  |
| Wayne Tanda<br>Chairman      | League of California Cities,<br>City of San Jose                    | (408) 277-4945   |
| Merry Banks<br>Vice Chairman | California State Automobile Association,<br>San Francisco           | (415) 565-2297   |
| Bruce Carter                 | California State Association of Counties,<br>Shasta County          | (916) 225-5661   |
| Capt. Joe Farrow             | California Highway Patrol,<br>Sacramento                            | (916) 657-7222   |
| Dick Folkers                 | League of California Cities,<br>City of Palm Desert                 | (760) 346-0611   |
| Jack Kletzman                | California Department of Transportation,<br>Sacramento              | (916) 654-4715   |
| Ray Mellen                   | Auto Club of Southern California                                    | (213) 741-4373   |
| John Wallo                   | California State Association of Counties,<br>San Luis Obispo County | (805) 781-4466   |
| Jack Kletzman<br>Secretary   | California Department of Transportation,<br>Sacramento              | (916) 654-4715   |

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|--------------------|--|------------------|
| Peg Anderson       | Traffic Signalization                                  | (619) 442-9286   |
| Jacob Babico       | San Bernadino County                                   | (909) 387-2833   |
| Mark Bertacchi     | Office of Traffic Safety                               | (916) 262-0985   |
| Bob Brow           | Sacramento County                                      | (916) 875-5327   |
| Bill Daiber        | San Diego Gas & Electric                               | (619) 621-8831   |
| Raymond Deese      | Electro-Tech's   | (714) 630-3011   |
| Fred Erbe          | Caltrans, District 7                                   | (213) 897-4656   |
| Charles Felix      | City of San Jose                                       | (408) 277-3070   |
| David Fulton       | Clary Corporation                                      | (800) 442-5279   |
| Hal Garfield       | Consultant   | (916) 487-2869   |
| Yunus Ghausi       | Caltrans, District 7                                   | (213) 897-0560   |
| Michael Harrison   | Light Guard System                                     | (707) 542-4547   |
| Robert Holden      | On-Line Power  | (213) 721-5017   |
| Dwight Ku          | California State Automobile<br>Association, Sacramento | (916) 443-2577   |
| Conrad Lapinski    | City of Mission Viejo                                  | (714) 470-3039   |
| Luu Nguyen         | Caltrans, District 7                                   | (213) 897-5689   |
| Paul Pace          | City of Oceanside                                      | (818) 458-5908   |
| Bill Padmore       | Caltrans, District 7                                   | (213) 897-0550   |
| Chris Ramstead     | Los Angeles County                                     | (818) 458-5908   |
| Ahmad Rastegarpour | Caltrans, Sacramento                                   | (916) 654-7143   |
| Hamid Rifaat       | Caltrans, District 7                                   | (213) 897-0343   |
| Sal Rosano         | City of Santa Rosa                                     | (707) 543-3558   |
| Dave Royer         | Consultant   | (805) 255-6556   |
| Ramona Smith       | San Diego Gas & Electric                               | (619) 621-8831   |
| Stuart Spoto       | Hewlett-Packard  | (408) 435-6260   |
| Massoud Tajik      | Caltrans, District 8                                   | (909) 383-4226   |
| Sharif Traylor     | California Energy Commission                           | (916) 654-4104   |
| Gerald Tripp       | Caltrans, District 6                                   | (209) 488-4174   |
| Steve Weinberger   | W-Trans  | (707) 542-9500   |
| Stewart Wilkerson  | Dialight Corporation                                   | (702) 233-3083   |
| Robert Zeigler     | Marin County   | (415) 499-6336   |

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MOTION: By Bruce Carter, second by Ray Mellen, to adopt the minutes of the Sacramento meeting, held on September 5, 1996. Motion carried 8-0.

**ELECTION OF OFFICERS**

MOTION: By Jack Kletzman, second by Dick Folkers, to retain the current Chairman and Vice Chairman. Motion carried 8-0.

**92-18 GOLF CART SYMBOL SIGNS**

Dick Folkers reported that Ms. Linda Brown of the FHWA sent a FAX which indicated that the FHWA has approved the golf cart crossing symbol. The symbol has been modified to include a golf bag and clubs. It appears that the federal symbol includes a SHARE THE ROAD supplemental plate. Folkers noted that, even though AB110 allows any community in California to adopt the golf cart program, the City of Palm Desert will continue with an annual report to analyze safety factors. Folkers said that the recommendation for adoption of the symbol sign by the Committee would conclude the experiment under the CTCDC auspices.

Dick Folkers said that a supplemental plate such as GOLF CART XING or GOLF CART ROUTE would suffice and there does not seem to be a need for a SHARE THE ROAD supplemental plate. He read, "This amendment to the MUTCD adds a new section, 2C-39, including a discussion regarding SHARE THE ROAD word message (W16-1) which may be used with farm machinery, the bicycle symbol, or other appropriate symbols where a need exists to warn drivers to share the road with other modes of roadway transportation." Folkers interprets this as a "may" condition and feels that all of the circumstances experienced so far don't require such a sign.

Dick Folkers told the Committee that along a golf cart route, the City would use the symbol sign with a GOLF CART LANE supplemental plate, both of which would be green and white. Where there is a need for a warning sign on a cross street, the City would use the symbol sign with a GOLF CART XING supplemental plate, both of which would be yellow and black.

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**92-18 GOLF CART SYMBOL SIGNS (continued.)**

The FHWA recommends that educational plates for symbol signs be left in place for three years. Folkers anticipates using four supplemental plates - GOLF CART ROUTE, GOLF CART LANE, GOLF CART XING, AND GOLF CART PARKING. Golf cart lanes may have dual usage and if so, will be appropriately signed. John Wallo suggested reviewing AB110 to insure that sign policies are consistent with the law.

MOTION: By Dick Folkers, second by John Wallo, to recommend approval of the symbol sign and the appropriate educational plates for use in California.  
Motion carried 8-0.

ACTION: Item completed.

**93-18 CROSSWALK, SEQUENTIAL LIGHTING**

Sal Rosano recalled that the City of Santa Rosa installed two locations in 1994 and a third location in April of 1995. These sites are still functioning. The only significant difference between the Santa Rosa installation and the installations that will exist in five new test locations, is that the new locations will use a presence detector instead of push button activation device. Rosano believes presence detector activation to be superior, because a significant number of pedestrians were not using the push button device and a pedestrian is less likely to believe the device would offer some degree of additional safety. The five new test locations are the cities of Fort Bragg, Willits, Lafayette, West Hollywood, and Petaluma.

Steve Weinberger, the consultant for the five new test locations, informed the Committee that a sixth location, the City of Camarillo, had decided to represent itself and that he does not know the status of their experiment. Weinberger recalled that the test criteria consisted of his initial proposal and subsequent responses by Committee members.

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**93-18 CROSSWALK, SEQUENTIAL LIGHTING** (continued.)

Steve Weinberger said the study will be a "before" and "after" evaluation of driver and pedestrian reaction to the proposed device. Driver reaction consists of travel speed, approach speed, deceleration, and braking distance. FHWA is funding the test in the City of Petaluma and the test results are being evaluated by the University of North Carolina. Weinberger has received comments from experts at that institution. As a consequence, Weinberger has added a study of pedestrian attraction to the device and an evaluation of the device at night. Neither of these aspects were evaluated in Santa Rosa.

Steve Weinberger told the Committee that the majority of the "before" conditions have been evaluated. The device is fully operational in Petaluma and is about to be installed in Fort Bragg, Lafayette, and Willits. West Hollywood expects installation in March. The "after" evaluations will be conducted one month after installation. The presence detector will use microwave ultra sonic technology. Weinberger observed this unit in the field and feels it works very well. He saw no false triggers from vehicles. A problem in the Santa Rosa study was that pedestrians expected some pedestrian signal after pushing the activation button. Data collection is anticipated to be completed in April and reported in May.

Steve Weinberger described his study of "pedestrian attraction" as an evaluation at two locations by a "pedestrian magnet" study. Factors include recording where people enter the street, how many times they look, the speed of the gait , and what the vehicle is doing. Data is taken "before" and "after" to determine if pedestrians are just as cautious in crossing a street as they were before the installation of the device. Weinberger's recommendation for using the presence detector is to have pedestrians cross as though no device had been installed.

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**93-18 CROSSWALK, SEQUENTIAL LIGHTING** (continued.)

Steve Weinberger said he had no knowledge of other study sites being financed or evaluated by the University of North Carolina. Weinberger's report in May will contain descriptions of each location, a summary of all criteria including average speed, average deceleration, average braking distance, and interviews of driver reaction. There will be a description of any change in reaction and may have recommendations for signing and marking. John Wallo requested that any submittal provide sufficient time for review prior to the meeting.

Wayne Tanda recommended that the Committee be prepared to take definitive action and that if there were any concerns from members of the Committee, they should be forwarded to Weinberger. Ray Mellen concurred with requesting cost estimates for the device. Mellen told the applicant that the Committee may not necessarily have a final decision at the next meeting. A final decision is dependent on getting the report in a timely manner and whether the report is satisfactory to members.

Jack Kletzman requested accident data be recorded at the intersections. Kletzman expressed concern that the Committee would come to a conclusion at the next meeting. He felt that the "after" data needed to be approximately six months after installation to be valid. Clearly there isn't sufficient time for this to occur before the next meeting.

Sal Rosano said that the City of Santa Rosa presented the six month data to the Committee at the last meeting at all three locations and they continue to demonstrate the same positive driver reaction. Rosano offered to do a two year follow up in Santa Rosa. Rosano expressed frustration at why the process takes so long. He feels that it will take many years to determine the long term value of the device and he doesn't want to stay in a test mode for that length of time. Rosano has been contacted by cities in New York and Florida interested in testing and he has referred them to the FHWA.

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**93-18 CROSSWALK, SEQUENTIAL LIGHTING** (continued.)

Jack Kletzman pointed out that it has been the Committee position that motorists react to any newly installed traffic control device. Data should be collected after the novelty wears off, in order to be valid. A lapse of time before measuring the "after" condition increases the likelihood that the data collected measures driver reaction to the device itself as opposed to the novelty of the device. Kletzman questioned whether the Committee will be able to evaluate the device, if data from the new test sites don't really measure an "after" condition. With respect to Santa Rosa, there were two test sites with complete data from only one test site. That test site data indicated no significant change between the "before" and "after" condition. He feels this is inconclusive. *[There were four test sites and the Phase II Final Report. had two sites reporting data.]*

Steve Weinberger said Santa Rosa had tested all the sites one month later and one location a year later. Weinberger recalled that there was no significant difference between the two "after" studies. He offered to include the Santa Rosa data as a reference in next report.

Sal Rosano told the Committee that changes had been made to the Santa Rosa test sites. This occurred very early in the test. One month after initial installation, additional devices were added to all locations and the flashing device was upgraded. Rosano said that improved behavior by drivers continued to be improved six months and a year later. He contends that if the one month "after" data at the new tests is similar to the one month "after" data at Santa Rosa, then it can be assume from the one year follow up test in Santa Rosa, that the same long term implications should be true for all the other test sites. The new installations are substantially the same as in Santa Rosa, except for the detection system.

Sal Rosano told the Committee that there had been another pedestrian fatality in the crosswalk and there is a demand to do something. The City of Santa Rosa is confronted with alternatives which are far more expensive than the proposed device. Rosano wants approval so that cities can feel free to do their own economic analysis and determine if the device is warranted.

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**93-18 CROSSWALK, SEQUENTIAL LIGHTING** (continued.)

Bruce Carter requested an economic comparison between the proposed device and an overhead flashing light. Carter said that in its deliberations, the Committee looks at what constitutes an effective traffic control device. He read "An effective traffic control device has five basic requirements. Fulfill a need, command attention, convey a clear simple meaning, command respect of road users, and give adequate time for proper response." He suggested that the study has to make clear that we are fulfilling all these requirements.

Bruce Carter said that most of the time an accident analysis will determine whether the device has any value. The proposed device is in a nebulous area because there aren't many accidents in crosswalks. But when we do have accidents in crosswalks they are pretty bad and it becomes an emotional issue. It is difficult to develop proof that shows the proposed device will do any good. Carter agreed with Kletzman that most new devices work well for a short time and then they are ignored by the motorist. Right now motorists are ignoring red traffic signals.

Sal Rosano said they would respond to the question of costs but he is concerned about the validity of such figures because of the wide swing in values depending on the location, configuration, and whether the unit is mass produced. They would also respond to the five criteria of an effective traffic control device, with the exception of having a longitudinal study of the death rate of pedestrians in crosswalks with or without these devices because that would take 15 or 20 years. A Principal of a high school, where one of these devices has been operating for two years, has written to the City that there would be a revolt by the parents, if the device were removed. They believe the device is effective and to date there has been no accidents at the test locations.

Sal Rosano said motorists say they see the devices and begin slowing because this is unique to pedestrians and only operate when pedestrians are present. Motorists ignore overhead flashing lights because they usually are in continuous operation and become part of the background.



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**93-18 CROSSWALK, SEQUENTIAL LIGHTING** (continued.)

Harold Garfield expressed support for illuminated pavement markers. He suggested not limiting the color or application to crosswalks. He cited the practice of using red "x"s and green arrows for reversible lane operations on the Coronado Bridge and red pavement markers are used to prevent wrong way movements at exit ramps. Illuminated yellow flashing pavement markers were also used at an approach to a traffic signal in a high fog area in San Mateo County

Chris Ramstead requested additional work on the draft of suggested warrants. He pointed out that 100 pedestrians per day is inconsistent with crossing guard warrants which can be as low as 20 per hour in the morning and afternoon. He is used to dealing with prevailing speeds rather than average speeds. He feels the prohibition of other traffic control devices 600' in advance or following crosswalk locations is poorly written because of the need for striping and marking. These are also traffic control devices. Hard warrants are needed to buttress engineering decisions from emotional and political decisions. He feels that not enough data will have been collected by the next meeting to permit Committee action. He concurred with Garfield's suggestion that lit pavement markers use should not be limited to crosswalks. John Wallo expressed concern that the only warrant will be the political warrant.

Dick Folkers suggested having the next meeting at a location that will allow us to view the device. *[In order to accommodate the time frame and to view the test site, the Committee agreed to meet no earlier than June 19th, in the vicinity of the City of Lafayette.]* Folkers feels that this device is valuable and it should be an option of the local community to put their money into this or any other approved traffic control devices.

MOTION: By Dick Folkers, second by Joe Farrow, to consider approval at the next meeting. Motion failed 2-6.

ACTION: Item continued.

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**94-3 STOP SIGNS AT MID BLOCK**

Ray Mellen presented the proposed guidelines for mid- block STOP signs. He suggested that the second bullet [*"Shall not be placed within 175 feet of an intersection."*] be expanded to include other controlled crossings. He is concerned about too many instructions confusing the motorist.

Wayne Tanda explained that the proposed guidelines, to be included in the Traffic Manual, are for the installation of STOP signs at non-intersection locations as provided for in CVC 21360 and 22450(b). We are not advocating the use of mid-block crosswalks. We are merely providing instructional guidelines for potential users in the State of California. Dick Folkers suggested that the 175' figure be increased. Wayne Tanda explained that the figure came from the fact that Sacramento has a minimum block size of 400' and that was divided in half and reduced by 25' for added leeway.

Wayne Tanda agreed with the first six paragraphs, but felt the conditions which may warrant a mid-block STOP sign as too specific. He preferred the following language written by Gary Foxen which was more general:

1. Where traffic signals are warranted and urgently needed, the mid-block stop may be installed as an interim measure.
2. Where the warrants for a multi-way STOP sign are met.
3. Where a combination of high speed, restricted view, delay and reported traffic collisions indicates a need for STOP sign control and less restrictive traffic control devices have proven unsuccessful.

Bruce Carter agreed with the concept of being more general to avoid legitimizing use of the signs. He said that most traffic engineers do not support the concept of mid-block STOP signs. John Wallo suggested being consistent with Vehicle Code terminology in using either non-intersection or mid-block crosswalk locations.

Jack Kletzman explained that the prohibition against use on State highways is because speeds are generally higher on State highways and mid-block STOP signs would tend to increase accidents. The purpose in citing specific warrants for use of mid-block STOP signs was to enable local agencies to refute political pressure. The warrants were basically taken from current warrants used for all way STOP signs.

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**94-3 STOP SIGNS AT MID BLOCK** (continued.)

Wayne Tanda said that the legislation spoke to between any two intersections. Tanda preferred to refer to the multi-way STOP sign warrants rather than repeating them because many local jurisdictions have their own local warrants. Tanda surmised that two years ago when it was voted down on a 4-3 vote, those who opposed the measure did so possibly because of a misunderstanding that the Committee was trying to legitimize mid-block STOP signs, when in fact the Committee was trying to deal with the legislation. The motion needed a six vote plurality to pass.

Wayne Tanda particularly likes the signal reference. If a signal warrant is met, including a pedestrian signal, it seems appropriate to take the interim step of putting in an all-way STOP as protection until a signal is installed. Sometimes a ped signal may be warranted and urgently needed but won't be installed for twelve months.

Ray Mellen felt that some State highways that run through small communities and are not appreciably different from city streets. John Wallo said that the legislation speaks to local authority which excludes State highways. Wayne Tanda reiterated his concern with the fact that many local agencies have their own standards for all-way STOP signs.

Harold Garfield said that the State has STOP signs on State highways at the entrance to State parks. Garfield contends this is at a mid-block location. He said that the intersection of a railroad crossing and a street is not considered an intersection, yet many such crossings are controlled by STOP signs. Wayne Tanda responded that the appropriate traffic control is covered under crossings of public streets and railroads.

Chris Ramstead said the most important thing is to establish the warrants because the law has enacted the existence of mid-block STOP signs. He agrees that State highways are excluded by law. He encourages warrants to include very busy driveways, to allow for reduction of warrants based on speed of traffic, and consideration of accident history.

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**94-3 STOP SIGNS AT MID BLOCK** (continued.)

Jacob Babico expressed concern that the 175' does not consider a driver reaction time of  $2\frac{1}{2}$  - 3 seconds and such a distance might impede the traffic flow at the intersection. He calculates that the 500 vehicles per hour is about equal to 50 cars per minute which is 1000' and is in conflict with the 175'. He feels the criteria should be the time pedestrians need to cross rather than the number of cars approaching the mid-block crosswalk. Jack Kletzman responded that there is no requirement to put the mid-block crosswalk at 175'. In those situations where there is insufficient distance, the prohibition is not to get any closer than 175'.

Joe Farrow pointed out that CVC 22450(b) allows the mid-block crosswalk but that enforcement would require a stop bar to cite under CVC 22450(a). John Wallo thought that the legislation was prompted by people experiencing delay when exiting some type of development. Wallo did not think the legislation pertained to mid-block cross walks with STOP signs. Jack Kletzman read CVC 22450(b) "Notwithstanding any other provision of the law, a local authority may adopt rules and regulations by ordinance or resolution, providing for the placement of a STOP sign at any location on a highway under its jurisdiction, where the STOP sign would enhance traffic safety."

Dick Folkers suggested that the limit line be changed from a "should" to a "shall" condition to allow police the ability to cite. Joe Farrow said authorities could cite under a local jurisdiction ordinance. Farrow said that if there were a crosswalk, citations could be issued under CVC 22450(a) otherwise an ordinance is needed. Bruce Carter said that normally there is a limit line. The consensus of the Committee was to add to the fourth paragraph of the proposed guidelines, whenever mid-block STOP signs are installed limit lines or crosswalks shall be installed.

Bruce Carter suggested eliminating that the prohibition against use on State highways because the Statute pertains to local agencies and therefore redundant. Jack Kletzman agreed that it was redundant but wanted to retain the statement for those that might not be familiar with, or refer to, the Statute.

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**94-3 STOP SIGNS AT MID BLOCK** (continued.)

David Fulton suggested that all the supplemental devices in paragraph four be mandatory. Bruce Carter responded that the distance required for all the supplemental devices may not be available. Jack Kletzman wanted to allow the city traffic engineer enough flexibility to construct the appropriate installation.

An unidentified member of the audience wanted to know if pavement markings could also be used with a crosswalk. Wayne Tanda responded that the pavement markings were optional and could be used.

MOTION: By Wayne Tanda, second by Dick Folkers for recommending adoption of the proposed "GUIDELINES FOR STOP SIGNS AT NON-INTERSECTION LOCATIONS" modified as follows:

Replacement of the last four paragraphs with

1. Where traffic signals are warranted and urgently needed, the mid-block stop may be installed as an interim measure.
2. Where the warrants for a multi-way STOP sign are met.
3. Where a combination of high speed, restricted view, delay and reported traffic collisions indicates a need for STOP sign control and less restrictive traffic control devices have proven unsuccessful.

Deletion of the 175' minimum distance from the intersection and the prohibition against use on State highways.

The additional requirement of whenever mid-block STOP signs are installed, limit lines or a crosswalk shall also be installed.

Motion carried 8-0.

ACTION: Item completed.

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**96-4 ITE PURCHASE SPECIFICATION FOR  
LED TRAFFIC SIGNAL MODULES**

Wayne Tanda recalled that the Committee recommended Caltrans consider adoption of the ITE LED interim purchase specifications for traffic signal modules with whatever modifications Caltrans deems appropriate and to report back to the Committee. Caltrans was conducting a human factors study with the University of California at Berkeley and was awaiting the results of that study.

Wayne Tanda said that as of September 1996, the ITE draft LED interim purchase specifications were being reviewed and appeared likely to be formally adopted. In October, the ITE review panel approved the specifications for publication. They were printed in the ITE Journal and comments were received. In January 1997, a special group met to address issues raised in response to the publication. The most significant issue raised was that, within the signal heads, a lot of heat is generated, and in the warmer climate could reach 185 F. Heat build up has a significant adverse impact on LED illumination. This problem has caused ITE to suspend formal adoption and the issue is being reviewed by a user / industry committee. Tanda expects the formal adoption of ITE LED interim purchase specifications will be delayed until September 1997.

Ahmad Rastegarpour said that Caltrans decided to complete its human factors study and then make modifications to the ITE LED interim purchase specifications. The result is the proposed draft specification in the agenda. This draft references the ITE specification. Because of the ITE action, a decision needs to be made whether to wait for ITE action or extract portions of the ITE draft specification and produce a Caltrans "stand alone" specification.

Ahmad Rastegarpour, discussing the human factors experiment, explained the goal of the study was to find out how the human eye reacts to LEDs as compared to incandescent lamps. The initial study was conducted with sixty observers. This was later reduced to six observers when it was found there was no significant statistical difference in the number of observers. The study is based on six observers. The core of the study was conducted with a 12" red LED traffic signal. The LEDs use AlInGaP technology and this is the only technology sanctioned in the Caltrans specification.

**96-4 ITE PURCHASE SPECIFICATION FOR  
LED TRAFFIC SIGNAL MODULES (continued.)**

Ahmad Rastegarpour explained that the study employed the hetrochromatic flicker photometry method to compare brightness of the LED and incandescent lamps. The incandescent lamp is optically superimposed on the LED equivalent. The level at which both light sources appear equally bright, to the human eye, defines the reference point. The useability factor is the ratio of the luminance of the incandescent lamp to the luminance of the LED lamp when they appear to be equally bright. AllnGaP technology in a 12" red LED lamp produces a useability factor of 0.99. This is more than sufficient for observers to see equivalence between the two light sources. Field tests were conducted to verify the laboratory tests. At a distance of 460 feet, at a speed of 45 mph, both light sources appeared equally bright.

Ahmad Rastegarpour said that the Sun Phantom effect was also checked in the field. The Sun Phantom effect occurs when the sun is low and behind the observer. The sun may reflect off the surface of a lamp in such a way as to give the impression the lamp is on. The LED lamps demonstrated a strong advantage over incandescent lamps because its lens reflects much less light back at the observer.

Ahmad Rastegarpour, referring to the intensity scale of the draft interim report from Berkeley, explained that a range was established where the LED looks as bright as the incandescent light source when they were set at 59 candelas and higher. The future safe minimum value is when you have 59 candelas and higher. The current ITE draft, using the 44 point test method, recommends an acceptance level of 399 candelas. The range should be sufficient to provide for the NCHRP future test minimum acceptable level. Rastegarpour told the Committee that the draft specification included red arrow and red hand signal indications. The test results for these devices were not given to the Committee, because testing was completed after the draft interim report had been published.

**96-4 ITE PURCHASE SPECIFICATION FOR  
LED TRAFFIC SIGNAL MODULES (continued.)**

In response to questions from the Committee, Ahmad Rastegarpour said that color blindness was not included in the test because other studies indicate that it is not a significant factor. Rastegarpour noted that some amber color sun glasses do filter out the red light source. The effect is to increase the useability factor by 2 or 3% which is still negligible. He explained the Intensity Scale of the Interim Report shows that 399 - 59 candelas as the observable range in which LED and incandescent light sources are equally bright. Even though, at 45 mph and 460 feet, red LEDs with a light intensity of 59 candelas are identifiable, 59 candelas is not the minim safe value that should be used. 399 candelas is the current minimum ITE requirement. Rastegarpour told the Committee that the initial sixty observers comprised a cross-section of the driving population. The subsequently reduced group of six observers were either teachers or students. The reduction was made because there was no significant statistical difference in their observations.

Stewart Wilkerson observed that 59 candelas is a relatively sever test of the conspicuity of both incandescent and LED signals. He felt that both light sources passed the test handily. Ahmad Rastegarpour was reluctant to use the term "test" because the only recognized test is the 44 point test, which is set at 399 candelas. Rastegarpour pointed out that tests were conducted with only one manufacturer's LED module and may vary for other manufacturers.

Charles Felix established that, although these levels of light intensity do not have the same visibility, there was some confidence that a linear relationship exists from 59 to 399 candelas. Wayne Tanda established that if the NCHRP study came up with a minimum standard, less than the 399 candelas, then that illumination standard would be the norm for all types of light sources. Tanda reasoned that a lower illumination would be created with a lower wattage source, so that if the standard were reduced a lower wattage could be used. Ahmad Rastegarpour pointed out the minimum standard could also rise as a result of the NCHRP study. Rastegarpour said that the study indicates that if the incandescent level is reduced from 399 candelas the LED level can be reduced.



**96-4 ITE PURCHASE SPECIFICATION FOR  
LED TRAFFIC SIGNAL MODULES (continued.)**

Ahmad Rastegarpour said that the human factors study will examine other alternative illumination sources for traffic signals and is continuing. The Interim Status Report presented to the Committee is a portion of the study being conducted by Berkeley. At this point it appears that only the red LED is commercially viable. Only one manufacturer's device was tested because it was the technology that needed to be examined. Once the Caltrans specification is approved, a Qualified Product List (QPL) will be established for those manufacturer's LED's which meet the minimum requirements. It appears that all manufacturers using AlInGaP technology produce a similar level of intensity and durability. Rastegarpour explained that tests indicate that color detection can occur at 0.35 candela and color identification at 0.80 candela, but this is not the same as indicating brightness equivalence to the incandescent reference.

Jack Kletzman suggested that the Committee recommend the draft be approved. Ahmad Rastegarpour pointed out that the draft was a standard special provision (SSP) which references the non approved ITE specification. A Caltrans specification would be different than the draft presented to the Committee. Kletzman responded that the Caltrans specification would merely adopt the language of the draft ITE specification in lieu of the direct reference. Basically we have all the pieces. All that remains is to write the specification and avoid those areas where high temperature is a problem until there is some solution. Rastegarpour supported the concern that ITE has with diminished light output caused by high ambient temperature.

Wayne Tanda observed that, if Caltrans put the Committee into a continued advisory role, the Committee doesn't meet until June, and that could possibly delay Caltrans from acting to complete an LED specification. Jack Kletzman suggested that the Committee recommend support of the draft. This would show the Committee was in favor of Caltrans producing the specification. He contended that the real problem is to write the specification in such a way, as to avoid problems for which there are not yet viable economical solutions. This would allow everyone to use the technology developed thus far, where it was technically and economically feasible. Caltrans could either write a specification or, if there were a problem, wait for ITE to approve its specification.

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**96-4 ITE PURCHASE SPECIFICATION FOR  
LED TRAFFIC SIGNAL MODULES (continued.)**

Ray Mellen and Jack Kletzman established that on an interim basis 399 candelas appears acceptable to Caltrans and ITE, the power factor has been resolved and is no longer an issue, and diminished light output, due to heat build up within the housing, can be addressed by proscribing certain areas or cautionary language. The specification can be written.

John Wallo expressed concern that cities authorized by the Committee may not be gathering data. Wayne Tanda expected local agencies to provide information which will ultimately go into the NCHRP study. This ITE PURCHASE SPECIFICATION FOR LED TRAFFIC SIGNAL MODULES (Item 96-4) is a separate issue and is independent of LED test study by cities (Item 92-4C) which the Committee should continue to monitor. This item was put on the agenda to urge Caltrans to adopt some standard for local jurisdictions. Tanda felt that Caltrans has enough information and may not need any further Committee involvement. Jack Kletzman said the Committee needs some conclusion to the process. He advocated putting Caltrans in the position to either develop its own specification or to wait for ITE to approve its specification.

Dick Folkers said there are many cities in Southern California that want to use this technology. The technology is not unproven and only a specification is needed. Folkers urged to expedite the process if manufacturers can meet the specification. He told the Committee that LED signals had been used at locations in the low desert and there has been no problem. Heat may be a theoretical concern but these units indicate heat has not been a problem. The technology appears to work and cities would like a standard so the devices can be legally used.

Bruce Carter said there are a lot of people waiting to buy and use these devices and suggested the Committee recommend Caltrans adopt an interim specification based on the draft SSP and the ITE draft. Wayne Tanda supported Carter, but cautioned that Caltrans can no longer tie into the ITE specifications because those specification may not be ready until September. That may be longer than Caltrans may wish to wait.

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**96-4 ITE PURCHASE SPECIFICATION FOR  
LED TRAFFIC SIGNAL MODULES (continued.)**

Dave Royer expressed concern about degradation. It takes a 120 watt incandescent bulb to meet the ITE minimum specification. That bulb may degrade 11% over its lifetime. The ITE specification for LEDs says, in effect, you can start with 120 watts and go down 40%. He doesn't know anyone in California using 70 watt incandescent bulbs in 12" signal heads and not getting sued for it. He visited the Caltrans Fresno test and visually compared LED traffic signal modules, which have degraded over 30%, with 150 watt incandescent bulb traffic signal modules, and some brand new AllnGaP LED traffic signal modules put in by the City of Fresno. The degraded LED lamps had noticeably less conspicuity. They were so dull that when the green lamp came on it would startle a motorist. He urged Caltrans to look at the degradation issue.

Wayne Tanda told a member of the audience that the status of local agencies, who were using LEDs and had not applied for experimental status from the Committee, would be that they are not in compliance with State standards. Their city attorneys would assess the exposure to liability. This Committee is trying to provide guidance for the majority of jurisdictions who have yet to install LEDs.

Harold Garfield claimed that there was no need for any local agency to come before the Committee because ITE had adopted a standard. Wayne Tanda responded that ITE had developed a draft which was approved for final distribution. Based on the comments received from the final distribution, ITE decided not to adopt the specification but to do additional investigation. Jack Kletzman responded that the California Vehicle Code says that the Department of Transportation (*Caltrans*) is responsible for adopting standards before they can be used in California. At this time, there is no Caltrans standard for LED usage.

Ahmad Rastegarpour said that the human factors study indicated a large range over which LEDs and incandescent light sources have equivalent visibility but that is not the same as establishing a safe minimum level. Ray Mellen requested that Caltrans specification address the issue of intensity output.

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**96-4 ITE PURCHASE SPECIFICATION FOR  
LED TRAFFIC SIGNAL MODULES (continued.)**

Wayne Tanda pointed out that the Draft SSP refers to a non-existent ITE publication. Jack Kletzman responded that in the event Caltrans formulates a specification, they would incorporate the ITE Draft or in some other way expand the SSP to handle additional requirements. Obviously Caltrans could not refer to an unapproved document. The other course of action is to wait for approval of the ITE specification. Kletzman said he was asking for a recommendation from the Committee that would support the flexibility to do one or the other. Ahmad Rastegarpour cautioned that the worst case scenario was that Caltrans waits for ITE who waits for NCHRP.

MOTION: By Jack Kletzman, second by Merry Banks, to endorse Caltrans' SSP and to encourage Caltrans to adopt a full specification. Motion carried 8-0.

ACTION: Item completed.

**96-7 SPEED LIMIT SIGNING**

Ray Mellen explained that the Auto Club of Southern California had some concerns about a lack of speed limit signing because of the changes in the law. It had been suggested at the last meeting to continue the item so that Caltrans would have some time to formulate a policy for the Committee to examine. Mellen said that the proposed revision to the Traffic Manual substantially addresses the concerns expressed by the Auto Club.

Jack Kletzman told the Committee that in the Agenda exhibit, Traffic Manual Section 8-03.4, Speed Limit Signs and Markings, item E, State-line Signs has a duplicate line. Kletzman also said that in discussing speed limit regulations, speeds are used as categories. 70 mph is one category, 55 mph is a second category, but the 65 mph category was omitted. The required sign intervals for 65 mph will be the same as they are for 70 mph. Both these corrections will be made as soon as possible.

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**96-4 96-7 SPEED LIMIT SIGNING** (continued.)

Ray Mellen suggested that the 40 km be significantly lower. Conventional highways use 8 - 16 km intervals. Bruce Carter observed the 40 km is a maximum spacing and in rural locations that seems appropriate. Mellen agreed that there were locations where that spacing was no problem, but cited I - 15 in District 8 as needing more signs. He feels that an interval in the realm of 20 km might be more reasonable.

Bruce Carter suggested instead of using a number, to allow engineering judgment based on physical characteristics of the roadway. Jack Kletzman said that engineering judgment should be used, based on the instruction that "The 40 km interval may be modified to include locations following entrance ramps from significant traffic generators." In urban areas the spacing interval should be reduced. Ray Mellen remained concerned because on I-15 there are some intersecting State highways that are not significant traffic generators. Traffic coming in from the coast would not have speed limit information when entering the Interstate highway.

Jack Kletzman said he could not accept a reduction to 20 km. It was his understanding that 40 km is the current standard for rural freeways. The intersection of a new route should cause the traffic engineer to consider additional signs and that was the intent of the provision. Reducing the space interval to 20 km would make it mandatory everywhere throughout the State. Bruce Carter pointed out that would make Caltrans put up twice as many signs as now exist. John Wallo believes that a 70 mph sign is not needed.

Joe Farrow said that 70 mph speed limit signs are not needed any closer than 40 km because it is the maximum speed limit, but adding the 65 mph causes a dilemma that the motorist may not know the speed limit. When the speed limit is 55 mph, the interval is down to 8-16 km, and we are doing that because the speed is greatly reduced from the maximum speed limit and we are trying to inform the motorist. He suggested spacing maximums for 65 mph be set similarly to the 55 mph spacing to avoid defendants claiming they thought the speed limit was 70 mph. Farrow said the CHP enforcement policy was very tight on the 70 mph speed limit. Bruce Carter responded that speed limit signs are put up at most ramps and there aren't many ramps more than 25 miles apart, even on I-5.

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**96-7 SPEED LIMIT SIGNING** (continued.)

Joe Farrow suggested modification for the 65 mph speed limit to allow 40 km or where the need exists. Jack Kletzman said that was the purpose of the modification following entrances paragraph. Farrow asked that the paragraph be tightened. Bruce Carter suggested dropping the "from significant traffic generators." This was agreed to by a consensus of the Committee.

Wayne Tanda requested clarification. Jack Kletzman explained that Gary Foxen had originally suggested that the number of speed limit signs be increased to better inform the motorist. He proposed a system for determining the spacing of these speed limit signs. Kletzman had agreed that more signs were needed but felt the proposal went too far. He then suggested that Caltrans work out some standard that would be brought back to the Committee for their concurrence.

MOTION: By Ray Mellen, second by Jack Kletzman, to endorse the proposed revision to the Traffic Manual subject to, elimination of the repetitive line, inclusion of the 65 mph with the 70 mph maximum spacing, and elimination of the verbiage "from significant traffic generators." Motion carried 8-0.

ACTION: Item completed.

**97-1 CTCDC BY-LAWS**

Jack Kletzman explained that the Committee held a meeting to discuss the by-laws. The Committee recommended changes to the existing by-laws to more accurately reflect Committee operations. Where those changes represented a consensus of the Committee the changes were made. Other suggestions which may not have been a consensus were not made. The draft was sent to Committee members and approved. Kletzman said he was unhappy with the draft because of its organization. This problem surfaced at the initial meeting when Wayne Tanda extracted the purposes of the Committee from one section of the by-laws and there were other purposes in a separate section. Kletzman reorganized the by-laws and that is the draft presented for Committee approval.

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**97-1 CTCDC BY-LAWS** (continued.)

Merry Banks thought that everyone involved did a good job. Wayne Tanda noted that the by-laws or any amendments become effective upon approval of the parent organization. He also noted that the by-laws may be amended by a three-fourths vote of the eight delegates. One is a procedure and the other is an adoption.

John Wallo established that the Traffic Manual was underlined because it is a publication. He was also concerned that identifying the Traffic Manual limited the scope of the Committee. For example, the Committee deals with bicycle signing and striping which are in the Design Manual. Jack Kletzman explained that bicycle facility designs are in the Design Manual or may be in a stand alone manual, but the signing and striping standards will be retained in the Traffic Manual. Wayne Tanda responded that the Committee specifically put that verbiage in, at the workshop, to identify items on which the Committee actually advises Caltrans. Tanda felt that the by-law provision that promotes the uniform and functional design and application of traffic control devices would retain the broad scope desired by Wallo. Tanda suggested for consistency to underline the Manual on Uniform Traffic Control Devices.

Ray Mellen suggested that the presentation to the parent organizations indicate the changes made. Jack Kletzman said he had tried to do that, but because of the reorganization, the changes were too numerous. Dick Folkers suggested attaching a copy of the old by-laws for reference. Kletzman agreed. Wayne Tanda suggested that the letter of transmittal include a statement that the substance of the changes were minor in nature.

MOTION: By Bruce Carter, second by Dick Folkers, to approved the revised by-laws as amended. Motion carried 8-0.

ACTION: Item completed.

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**97-2 TODS SIGNING**

John Wallo explained that the County of San Luis Obispo is trying to take the lead in producing wine grapes. The local vintners went to the Board of Supervisors and asked for unique signs on County roads and State highways to attract tourists. The president of the Grape Growers Association came forward with a packet of information from some State agency. The sign specification had a signature unfamiliar to Wallo. Wallo found out that the Permits Office in Caltrans was providing the instructions on the procedure for installing the Tourist Oriented Directional Signs (TODS.) The signs can be for gift shops, bed and breakfasts, wine tasting, and other industries. Wallo was concerned about possible conflicts and the establishment of policies for their use.

Jack Kletzman thanked Wallo for bringing the matter to his attention. There was some confusion on the part of Caltrans as to what procedures to follow in order to comply with recently enacted legislation. The process is handled operationally by the Permit Office, who thought the Office of Tourism was the authority for this program, and was not aware that the Office of Signing and Striping was supposed to sign off on sign specifications. Even some people in Signing and Striping thought the Office of Tourism had the authority. As Wallo pointed out, this would be in violation of the Vehicle Code unless the standard is adopted by Caltrans. Kletzman brought this to everyone's attention and believes that Caltrans is now together on the procedure.

Jack Kletzman said the Office of Tourism provides a valuable service in that they negotiate, among industry, a consensus of what that industry feels is an appropriate symbol sign. They are probably in a better position to do that than Caltrans. Caltrans is appreciative of their efforts. Nevertheless, when the Office of Tourism recommends a sign, the Office of Signing and Striping has the responsibility to make sure it is appropriate for traffic operations.

Jack Kletzman expressed the opinion that one of the symbol signs, the Distillery symbol sign (SG-44B), seems inappropriate. Caltrans does not want to give the public the impression that drinking and driving is acceptable. The consensus of the Committee supported this opinion. Kletzman recommended that the remaining signs be approved.



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**97-2 TODS SIGNING** (continued.)

John Wallo said he had a copy of SG-44B which was signed and dated by someone and there is an apparent conflict. Ray Mellen said the Committee recognizes that the discussion refers to the exhibits in the agenda package which depict the symbol as a brandy snifter. Jack Kletzman said that he did not recognize the signature on Wallo's copy nor were there any objections to that symbol. The designation on Wallo's copy differs from the exhibit in the agenda. The sign specifications presented to the Committee need to be approved by the Office of Signing and Striping to become approved by Caltrans. They have not been and that is why the proposed symbol signs have been brought before the Committee.

Ray Mellen established that the Office of Permits would be responsible for enforcing the policy of the legislation in the permit procedure. Jack Kletzman advised the Committee that there were two bills involved AB 2239 and SB 768. The important differences are that SB 768 allows farm trail symbols, defines rural areas as fifty thousand population, and has no January 1, 1999 sunset clause. Bruce Carter expressed concern about getting funky signs on the road.

An unidentified member of the audience established that the signs could be installed on State highways and County roads. He felt signing to wineries was encouraging motorists to drink and drive. Jack Kletzman said the signing law was passed by the Legislature and it isn't within Caltrans purview to change that.

Wayne Tanda said that there is a belief that wineries are a tourist attraction. Tanda said that the Committee wasn't encouraging drinking and driving, nor even drinking, but that wineries are a tourist attraction and people want to go there. He said we are providing directions for people where they are destined to go.

Ray Mellen agreed with the member of the audience but noted that the law has curtailed the ability to use our engineering judgment. He observed that the Committee was acting responsibly, in at least recommending elimination of the brandy snifter. Dick Folkers pointed out that there is signing to coliseum and other arenas where the consumption of alcohol is much higher and a lot less controlled than at wineries.

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**97-2 TODS SIGNING** (continued.)

MOTION: By Dick Folkers, second by John Wallo, to recommend disapproval for the symbol sign which depicts a brandy snifter (SG-44B) and to recommend approval the remaining TODS symbol sign. Motion carried 8-0.

ACTION: Item completed.

**PUBLIC COMMENTS**

None.

**INFORMATION ITEMS**

**93-12 PEDESTRIAN CROSSWALKS**

Jack Kletzman told the Committee that he was asked by Marin County to withdraw this item. He felt the matter could be handled administratively and no Committee action was necessary because the sponsor made the request. Kletzman wanted to inform the Committee for the record.

**92-4C LED STUDY, OTHER LOCAL AGENCIES**

Jack Kletzman said that this item was propagated by Item 93-12 in that there are a number of tabled Items which the Committee may want to delete such as Item 93-4 CONVEX MIRRORS. Bruce Carter said he just rejected a convex mirror because it was not a traffic control device and recommended the issue be put aside. Kletzman said it could be handled administratively. Wayne Tanda expressed concern that people do use them and there is no guidance. John Wallo thought it was something that could be handled by the permit process from a local agency. Tanda said that some jurisdictions do use mirrors on public right of way. Kletzman said most of the ones in San Francisco are on garages to warn exiting motorists of pedestrians and cross traffic.

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**92-4C LED STUDY, OTHER LOCAL AGENCIES** (continued.)

Wayne Tanda established that there was no party that had an issue with convex mirrors being used in public jurisdictions. He recommended deleting the item until such time as an issue arises. The consensus of the Committee agreed with this action. Jack Kletzman, returning to Item 92-4C, asked the Committee for their recommendation on this item. How should local agencies proceed with their LED studies in view of the fact that the Committee has essentially approved a specification? Kletzman suggested contacting the local agencies to ascertain the status of their experiment and if they had something valuable, request a final report upon completion of the experiment, otherwise cancel the experiment. Bruce Carter urged to collect a final report. Wayne Tanda felt that if a local agency asked for permission to experiment they need to file a final report. Tanda thought that anyone who is doing an experiment needs to provide the Committee with a status report at every meeting. Kletzman suggested discussing the matter at the workshop and the Committee concurred.

**96-A FOREIGN TRAFFIC CONTROL DEVICES**

Dick Folkers presented a slide show of traffic control devices in Rome and Israel.

**97-A STATUS OF FEDERAL STANDARDS FOR SIGN REFLECTIVITY**

Wayne Tanda explained that the FHWA is in a three step approval process for developing guidelines on sign reflectivity. First there is a publication in the Federal Register of an advance notice on rule making this month. The final rule is to be published in late 1998 to be effective in the year 2000. Tanda encouraged Caltrans to keep abreast of developments because it has the potential of having significant impact on some jurisdictions. The City of San Jose had just completed a field review and based on FHWA preliminary standards, estimate that 5-20% of an agencies signs may fall below the recommended reflectivity level. In San Jose that would be about 10,000 signs. There is no current annual sign replacement program for the City. The cost of initial replacement could be very significant, but there is time to prepare for this eventuality. Tanda said that "markings" will follow a similar process but the program is further behind.

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**OFF-AGENDA ITEMS**

Wayne Tanda said that it has been reported that District 4 is considering doing away with "Botts Dots" and replacing them with thermoplastic. Jack Kletzman responded that recent media reports which make such claims are less than factual. *(Kletzman subsequently FAXed a letter to the Committee which essentially said Caltrans does not now use "Botts Dots." Caltrans uses raised pavement markers which are both reflective and non-reflective. Botts Dots were the forerunner of the non-reflective marker. Caltrans is continuously testing new products and standards to improve visibility and durability. Several experimental materials and patterns are currently under evaluation. There has been no decision to change standards at this time.)*

Dick Folkers announced he has been appointed to the National Committee on Construction and Maintenance. Folkers would like to see more members of the CTCDC Committee active in the National Committee, but that is a matter of agency sponsorship.

**ADJOURNMENT**

MOTION: By Jack Kletzman, second by Bruce Carter for adjournment.

Motion carried 8-0. The meeting was adjourned at 1:10 pm.

## **CALTRANS ACTIONS**

### **Item 90-7 BICYCLE SIGNAL HEADS**

Experiment in progress.

### **Item 92-4A TRAFFIC SIGNAL DIMMING, CITY OF SAN JOSE**

Experiment in progress.

### **Item 92-4B LED STUDY, CITY OF SAN JOSE**

Experiment in progress.

### **Item 92-4C LED STUDY, OTHER LOCAL AGENCIES**

Experiments in progress.

### **Item 92-18 GOLF CART SYMBOL SIGN**

Caltrans is in the process of making the sign specifications.

### **Item 93-2 L. E. D. STUDY, CALTRANS**

Experiment in progress.

### **Item 93-4 CONVEX MIRRORS**

Item deleted.

### **Item 93-10 SIGNING, LIME-YELLOW SPECTRUM**

Item tabled.

### **Item 93-12 PEDESTRIAN CROSSWALKS**

Item deleted.

### **Item 93-18 CROSSWALKS, SEQUENTIAL LIGHTING**

Experiment in progress.

### **Item 93-14 SPEED CONTROL SIGN, EXPERIMENTATION REQUEST**

Experiment in progress.

### **Item 94-3 STOP SIGNS AT MID BLOCK**

Caltrans in the process of formulating policy.

### **Item 94-10 PEDESTRIAN SIGNAL HEAD**

Experiment in progress.

## **CALTRANS ACTIONS**

### **Item 95-9 LEFT TURN LANE PROTECTED/PERMISSIVE SIGN**

Experiment in progress.

### **Item 96-3 ILLUMINATED LEFT TURN YIELD SIGN**

Experiment in progress.

### **Item 96-4 ITE PURCHASE SPECIFICATION FOR LED TRAFFIC SIGNAL MODULES**

Caltrans has approved a specification

### **Item 96-7 SPEED LIMIT SIGNING**

Caltrans in the process of re-writing policy.

### **97-1 CTCDC BY-LAWS**

By-laws are in the process of parent agency approval.

### **97-2 TODS SIGNING**

Caltrans has approved those signs recommended by the Committee. The Division of Tourism agreed the distillery industry sign (a brandy snifter) appears inappropriate and has referred it back to the industry for a revised symbol.